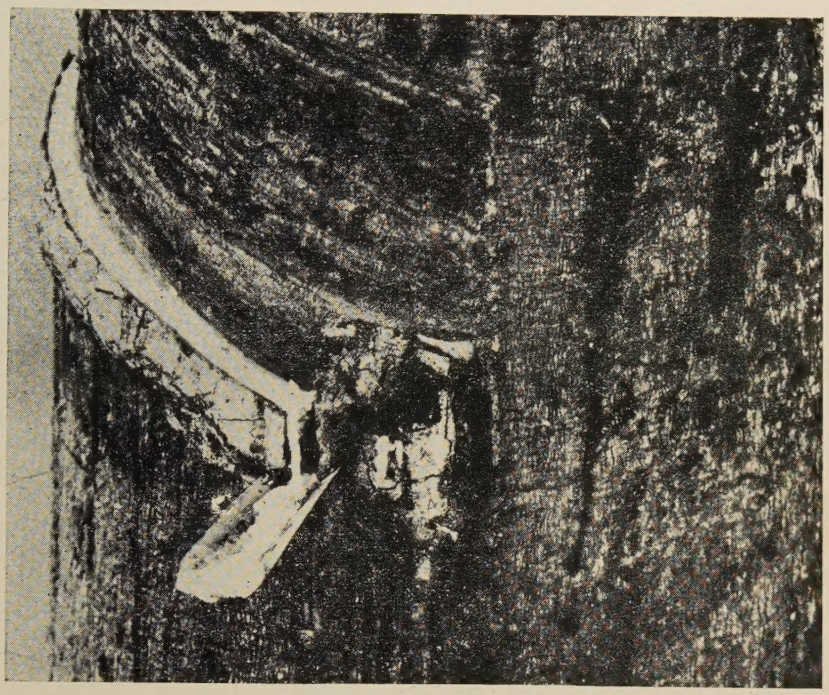
PLANTERS' BULLETIN

OF THE RUBBER RESEARCH INSTITUTE OF MALAYA



NEW SERIES NUMBER SEVEN

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Price
50 Cents

July
1953

R R I

LOCATION The Institute's Laboratories and Offices are at the third mile, Ampang Road, Kuala Lumpur.

CORRESPONDENCE All *letters* must be addressed to the Director, Rubber Research Institute of Malaya, Post Office Box 150, Kuala Lumpur. Special inquiries may be marked for the attention of a particular officer, if so desired (See Staff List in Bulletin No. 1, page 24). The address for *telegrams* is Searching, Kuala Lumpur. *Telephone:* Kuala Lumpur 3351/2/3. *Parcels* occasionally arrive without any indication of their origin. It is requested that senders will write their names and addresses clearly on the outside of all packages, and also advise the Institute by letter or telegram of their despatch. This is especially important for perishables, such as latex samples and plant specimens.

PROHIBITED PLANT SPECIMENS Attention of planters and others in territories outside the Federation of Malaya and the Colony of Singapore is drawn to the Malayan Plant Importation Rules which prohibit the importation into Malaya of any part of a plant, whether living or dead, unless it is accompanied by a permit issued by the Director of Agriculture, Federation of Malaya. No permit will be issued in respect of any diseased plant or any plant pest. Any plant imported in contravention of these Rules (whose object is to prevent the introduction of diseases or pests) will be destroyed without examination. Anyone outside Malaya who desires our advice on pests or diseases or any other matters that may require examination of living material must first submit an inquiry by letter giving the fullest possible description of their problem.

ADVICE Inquiries are invited from rubber producers in the Federation of Malaya, the Colonies of Singapore and North Borneo, and the territories of Sarawak, Brunei and Nigeria, who may require more detailed information applicable to their own special problems. *Interviews* should be arranged by letter or telephone, as members of the senior research and advisory staff are frequently absent on visits to plantations. The Institute is open from 8 AM to 1 PM and 2 PM to 4 PM on Mondays to Fridays, and from 8 AM to 12.30 PM on Saturdays.

EXPERIMENT STATION AND FACTORY This station of the R R I is situated 16 miles from Kuala Lumpur, at Sungei Buloh on the Kuala Lumpur — Kepong — Kuala Selangor road. Visits may be made on Mondays or Wednesdays by arrangement with the Director of the Rubber Research Institute (see *Correspondence* above). There is a guest house

PLANTERS' BULLETIN

OF THE RUBBER RESEARCH INSTITUTE OF MALAYA

Kuala Lumpur July 1953 New Series No. 7

Editorial: Clone Abbreviation

Regimentation and standardisation are things which many of us abhor, and the complete obliteration and subjugation of the individual seems to be the fate of the mass of the population in totalitarian states. It is one of the duties of the scientist to be systematic in his work, to marshal his observations and fit them if possible to rules and laws which have resulted from the many observations of previous workers. If he is to understand what his co-workers are doing in other countries, the scientist must have available a mutually understandable method of expression. The words and the definitions he uses to describe his work and his experiments must have meanings which cannot be misunderstood if his writings are to convey a proper interpretation of his investigations to his overseas colleagues.

We have no hestitation in presenting the proposals, outlined on page 85, for the standardisation of abbreviations of clone designations. The proposals are at present tentative, but we hope that they will be accepted for international use. Comments from our readers will be welcome.

There is nothing new in the idea, and a scheme of clonal nomenclature of hevea seeds with standardised abbreviations for clones had been partially decided upon between rubber scientists both in Malaya and in Indonesia when the outbreak of the Pacific war in 1941 prevented completion of the discussions.

Rules, which are simple and few, have now been proposed for abbreviating clonal names, and their adoption will eliminate confusion. In achieving the brevity and clearness of a systematic procedure the rules for abbreviation have inevitably produced one or two awkward departures from hitherto traditionally accepted expressions. Thus, it is difficult to break with the long established practice of using Tj. and TMS. (for Tjirandji and Tjiomas) and to have instead, Tjir and Tjio. These difficulties which may involve some sacrifice of personal preference are few and the strangeness which at first will arise when using such abbreviations will soon disappear, and will be more than offset by the gain in uniformity and clarity resulting from universal adoption of the code.

The six simple rules which are proposed are given with examples of their usage. A list of the better known clones and their abbreviations are also shown. International agreement has not yet been obtained on these rules, which will in the meantime be followed in future publications of this Institute.

R.R.I. '600' Series

BREEDING AND SELECTION OF IMPROVED STRAINS of rubber planting material at the Rubber Research Institute has taken place in three distinct stages. The first stage was from 1928 to 1932 when breeding and preparation of buddings from a restricted range of material resulted in the selection of the R.R.I. '500' series clones. As a result of retrenchment of staff in 1932 the breeding programme was suspended and no new work was undertaken until 1937.

The second stage was inaugurated in 1937 and breeding programmes were commenced and carried out until the Japanese occupation, when all progress remained at a standstill until the liberation. It is from the results of the programmes carried out from 1937 to 1941 that the clones were prepared from which we have selected the R.R.I '600' series.

The third stage commenced in 1946 when fresh programmes were instituted. These are being continued to date. The introduction of different genetic material from America leads us to hope that the improvement manifested between the R.R.I. '500' and '600' series clones can be maintained in future selections.

Experimental procedure — The technique employed in preparing the new clones before selection is outlined below.

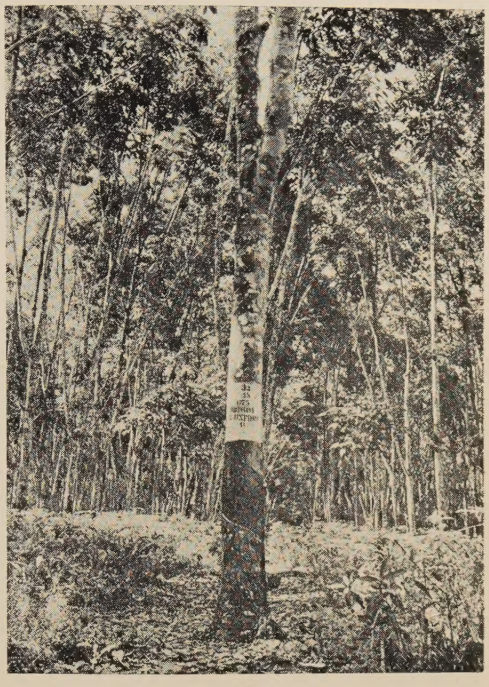
Thirtytwo parent clones were used in the five series known as Series 8 to 12 between the years 1937 to 1941. These clones were used in some or all of the Series in a cross and its reciprocal made by the method of hand pollination recently outlined in *Planters' Bulletin 5*, (page 29). The seeds obtained were germinated in a rat proof germination cage and were planted out in a protected nursery.

In this nursery the seedlings were allowed to grow for eighteen months to two years. They were then cut back at about three feet from the ground and later transplanted into statistically designed seedling trials, to discover the value of the seedling families obtained in our breeding work.

The bud wood obtained from these seedlings was used to establish small scale clone trials, each clone occupying 10 points. These trials could not be replicated owing to the large area involved, and the first evaluation therefore depends on a direct comparison of

RRI 601 budded 1939

the clone with the control clone Pil B84 which was budded in one eighth of the area in rows of seven trees between the clones under test. Planting was at 200 to the acre, later thinned to 140, except the clone trials for clones from the 1939 and 1940 hand pollinated seedlings (where thinning was delayed by the Japanese occupation) and the clones from the 1941 hand pollinated seedlings (which were not budded until after the occupation).



RRI 604 budded 1939

Selection — Some 1700 new clones were established in this manner during the years 1939 to 1942 and tapping commenced in 1947 for the majority of the clones; the more recently budded fields were opened in 1948 and 1949. Yields have been recorded twice monthly by cup coagulation, and the results shown in TABLE I are the weight of dry rubber in pounds per tree per year estimated at 160 tappings, on a tapping system of S/2.d/2.100%.

At the end of 1949, the yields of all the clones in tapping were considered and a preliminary selection was made on yield. The selection was further narrowed by considering the secondary characters of each clone with specific attention to the thickness of both virgin and renewed bark. Most of the 19 clones selected at this time are vigorous in habit.

In 1950 a further selection of 12 clones was made which included clones from the younger fields. These fields had suffered considerable neglect during the occupation, and later the trees in one of the fields were slashed by Communist terrorists. Our article therefore considers only clones RRI 600-623. If any of the other selections justifies release after large scale trial, further information will be given later. The clones may be inspected at the R.R.I. Experiment Station, Sungei Buloh, Selangor.

Yields and secondary characteristics — Four tables are attached dealing in some detail with the yield and secondary characteristics of the clones. TABLES I and II show the parentage of the clone, its yield in pounds per tree per annum from opening, and its girth, virgin bark and renewed bark measurements. TABLES III (A and B) shows the more subjective qualities of the clone as they are displayed on our Experiment Station at Sungei Buloh. It is possible that these secondary characteristics may be different when the clones are grown under different soil

conditions, especially that of the suitability of the latex for concentration by centrifugal methods.

Proving the selected clones — At present the only indication we possess of the value of the selected clones is their performance in the small scale trials already mentioned. The further testing of the clones has already been commenced in some 41 statistical trials on all the main types of soil and under the different conditions obtaining in Malaya. It is on the results of these trials over a number of years that we will base our final recommendations of these clones for planting. Most of these trials have been established, and it is hoped that tapping of some of them will commence in 1954.

TABLE I: YIELD OF CLONES RRI 600 – RRI 623 AT THE R.R.I. EXPERIMENT STATION

Clone	*Parentage of mother tree*	*No. of trees 1952*	*Yield in lb per tree per annum in year of tapping*					
			1st	*2nd*	*3rd*	*4th*	*5th*	*6th*
RRI 600	*Tj 1 × PB 86*	6	20.5	24.4	23.2	26.8	27.9	26.5
Control			8.1	8.2	9.0	9.9	11.9	13.0
RRI 601	*Tj 1 × G1 1*	6	10.5	16.2	16.3	16.4	24.7	18.3
Control			3.8	5.0	5.3	5.0	6.7	5.9
RRI 602	*Tj 1 × G1 1*	7	13.2	17.7	20.8	20.9	18.3	18.8
Control			4.8	5.2	3.8	4.9	5.8	6.2
RRI 603	*PB 86 × Pil B84*	7	14.6	17.3	18.1	21.2	21.4	27.5
Control			7.9	6.9	6.7	9.1	8.0	9.6
RRI 604	*Tj 1 × PB 49*	7	15.3	18.0	20.1	22.2	22.8	23.1
Control			4.9	4.7	4.9	5.1	4.8	4.3
RRI 605	*Tj 1 × PB 49*	7	17.3	25.8	27.1	19.5	24.7	25.1
Control			4.9	4.7	4.9	5.1	4.8	4.3
RRI 606	*Tj 1 × PB 49*	7	11.6	15.7	21.6	22.9	19.0	22.4
Control			3.2	2.8	1.7	3.6	2.5	2.4
RRI 607	*Tj 1 × PB 49*	6	15.2	18.8	21.3	20.5	19.9	19.3
Control			4.9	4.7	4.9	5.1	4.8	4.3
RRI 608	*AVROS 33 × Tj 1*	6	9.6	17.5	18.6	18.1	26.2	29.8
Control			4.9	6.0	4.3	5.3	6.1	5.6
RRI 609	*AVROS 157 × BD 5*	6	9.5	14.3	15.5	13.2	21.9	23.3
Control			5.6	4.8	4.8	6.9	7.4	7.2
*RRI 610**	*RRI 504 × Tj 1*	7	14.1	19.7	21.0	18.2	32.9	25.6
Control			6.9	8.7	7.8	6.1	8.4	6.4
*RRI 611**	*RRI 504 × Tj 1*	5	13.8	18.3	21.8	22.6	31.2	22.7
Control			5.5	7.5	8.6	8.6	10.4	12.7
RRI 612	*AVROS 157 × PB 49*	6	11.4	11.4	17.1	17.6	20.7	24.9
Control			7.3	3.9	5.3	5.0	6.1	7.8
RRI 613	*Tj 1 × RRI 509*	4	12.0	18.0	18.3	14.4	16.5	22.9
Control			4.0	5.7	6.2	6.5	7.8	9.7
RRI 614	*Tj 1 × RRI 509*	4	16.5	21.0	24.3	17.1	22.5	20.0
Control			3.8	5.7	4.6	4.4	4.8	4.5
RRI 615	*RRI 511 × Tj 1*	7	10.2	17.8	20.2	21.5	19.8	26.5
Control			7.5	11.2	11.5	11.4	12.9	14.3
RRI 616	*Tj 1 × RRI 507*	7	14.3	17.8	22.2	25.3	24.3	24.3
Control			5.3	7.0	9.1	9.8	8.9	13.6

STARCH IDENTIFICATION TEST

The following test for starch shows the presence of rice, sago or tapioca flour or other vegetable glue; it may be used by dealers and godown operators to check the coatings of bales which they receive. Thus they can protect themselves against subsequent claims and also induce their suppliers to use more suitable coatings.

1 Scrape enough coating from the bale to cover a five cent piece and place in a test tube or small tin.
2 Half fill the test tube with water or add about an eggcupful to the tin.
3 Bring to the boil and boil for 2 minutes.
4 Cool until quite cold.
5 Add 1 drop of iodine solution and shake gently.

A deep blue or violet coloration which forms immediately the iodine solution is added indicates the presence of starch. In the absence of starch there is no colour change.

A suitable iodine solution, which should be readily available at any dispensary, is prepared by adding 2 grams of potassium iodide and 1 gram of iodine to 100 cubic centimeters of water. Failing this ordinary first aid iodine solution will produce the colour reaction. To check the iodine solution or the colour reaction carry out the above test using as much household starch as bale coating powder.

Bone glue coatings are easily recognisable by their hard gritty texture and may be identified by a simple reaction similar to the above. The reagents have, however, to be controlled more carefully, and should identification of this type of coating be required, this can readily be done by submission of a sample to the R.R.I. Bone glue coatings are far less common than vegetable glues.

It will be appreciated that talc (that is, hydrated magnesium silicate) or calcium carbonate (whiting) should be employed in bale coating mixtures, and that kaolin (china clay) is inadmissible. Different coating powders can be distinguished as described in 'A Rough Test for Bale Coating Powders' given in *Planters' Bulletin* 2 (September 1952).

Should any difficulty be encountered which the above tests will not resolve, samples of the bale coating or bale coating powder should be sent to the R.R.I. for examination.

A reprint of this article may be obtained on request.

CHEMICAL DIVISION

A Code for Clone Abbreviation

THE FOLLOWING CODE, which is discussed in our current Editorial on page 71, will be employed throughout our publications pending international agreement on the matter. The list which follows the rules is not comprehensive, but rather illustrative.

SIX SIMPLE RULES

	Rule	*Example*	*Remarks*
1	*Do not abbreviate less known clones*	*Rantau Panjang (in full)*	*Avoids ambiguity, and difficulty in recognition*
2	*Omit fullpoints*	*AVROS (Algemene Vereniging Rubber planters Oostkust Sumatra)*	*Brevity, clarity (especially in tables)*
3	ONE WORD NAME: (*a*) *use first syllable* (*b*) *or use first two letters if consonants*	*Lun (Lunderston)* *Ch (Chemara)*	*Never one letter only (See 5)*
4	MORE THAN ONE WORD: *initials only (capitals)*	*FMS (Federated Malay States)*	*Capitals are used only for initial letters*
5	*If ambiguity would occur from using 3 or 4, employ longer abbreviation*	*Tjir (Tjirandji)* *Tjio (Tjiomas)* *Sid (Sidoredjo)* *SReko (Sungei Reko)*	*Not Tj* *Not S R*
6	*Leave a space between clone abbreviations and serial number (and or letter)*	*Pil B84* *CI 72E*	

BETTER KNOWN CLONES

Algemene Vereniging Rubberplanters Oostkust Sumatra	AVROS
Balombissie	Bal
Beau Sejour	BS
Bodjong Datar	BD
Bogorredjo	BR
Carey Island	CI
C H Meares	CHM
Chemara	Ch
Cultuurtuin	Cult
Deli-Batavia Rubber-cultuur Maatschappij	DBRM
Devon	Dev
Diyaberiyakande	DBK
Djasinga	Dj
Dunlop (Hillside Estate)	DH
Federated Malay States	FMS
Glenshiel	Gl
Gondang Tapen	GT
Heneratgoda	Hen

Hillcroft	Hil	Planterstrots	Pl
Hollandsch Amerikaansche Plantage Maatschappij	HAPM	Prang Besar	PB
Institut des Recherches sur le Caoutchouc en Indochine	IRCI	Proefstation voor rubber	PR
Kajang	Kaj	Raja Allang	RA
Kali Djeroek	KD	Rubana	Rub
Kali Wining	KW	Rubbercultuur Maatschappij	RM
Lampongiana	Lamp	Rubber Research Institute of Ceylon	RRIC
Landbouw Maatschappij Oud Djember	LMOD	Rubber Research Institute of Malaya	RRIM
's Lands Caoutchouc Bedrijven	LCB	Sabrang	Sab
Limburg	Lim	Sidoredjo	Sid
Lunderston	Lun	Sungei Reko	SReko
Malayan American Plantations	MAP	Sungei Tawar	STaw
Nabutemme	Nab	Sungei Tinggi	STin
Ong Yem	OE	Tandjong Kemala	TK
Pataroeman	Pat	Tjiomas	Tjio
Pilmoor	Pil	Tjirandji	Tjir
		Wagga	Wagga
		Wardieburn	Ward
		Waringiana	Waring

Names such as Millakande and Milleniya may best be given in full (Rule 1).

Available Nutrients in Malayan Soils

The deficiency of a plant nutrient in a soil is often first indicated by some abnormality in the crop which is being grown. The abnormality may appear as an unusual discoloration of the foliage, or a peculiar form of growth, and usually has a harmful effect on the fruit or seed which the plant produces.

Fertiliser tests, either in field trials or in pot experiments, will confirm a nutrient deficiency and indicate the magnitude of the fertiliser application required to remedy it. Such tests although they ultimately give valuable results, are lengthy and require the services of specialist scientists and trained supervising staff.

The chemical analysis of soils seems to offer a more convenient procedure for rating the productivity of a soil. And so it does,

up to a point. The complete or ultimate chemical analysis of any material will tell us exactly the elements, and their amounts, which are present. For soils we can thus determine whether any essential plant food is absent. However, many of the elements which occur in a soil and are necessary for normal plant growth may be there in insufficient quantity or may not be in a form which the plants can utilise. Hence our analysis of a soil will be of much more aid to the grower of crops if it tells him how much of the essential plant foods are in a form available to the plant.

Estimates of the availability of such elements as potassium and phosphorus in a soil have been based on extractions made by mildly acid solutions. This is not entirely an arbitrary choice of extractant, and one reason for using a dilute acid is that plant roots are supposed to excrete organic acids which attack the adjoining soil particles and render phosphate, potash, *etc* ions soluble and more easily obtainable by the plant.

Again, there is a limitation to the practical application which can be made of such information. For Malayan soils, these methods give a very narrow range for available phosphorus and whilst comparisons between fertile and infertile areas of the same soil type may allow discrimination between them, it is often impossible to assess or grade different soils on their available nutrients.

An account is given by Mr G. Owen in Communication 283 of the R.R.I. Journal, of comparisons of chemical and biological methods of estimating available phosphate and potash in Malayan soils, and a more reliable chemical method for estimating available phosphate is recorded which gives a range of values for available phosphate which is much wider than that obtained from methods used previously.

Deterioration of Latex

Precautions taken during collection and subsequent handling are not always adequate and unsuspected incipient decomposition can on occasion cause serious trouble. Mr K.C. Sekar and Mr M.W. Philpott, who have spent many years in their search for an improved method of assessing latex condition, have presented their paper *Determination of Volatile Fatty Acids in Natural Rubber Latex* as Communication 281 of the R.R.I. Journal. By a technique involving steam distillation they separate and estimate the organic acids which are formed in the latex by the natural processes of degradation. This method is many times more sensitive as a test of deterioration than the usual KOH total acid test, which fails to discriminate between those acids which destabilise, and those which have a stabilising effect. The volatile acid test should therefore enable deterioration to be detected and dealt with at an early stage, and is of great interest to both producers and consumers as a means of safeguarding production.

4 bales must not mass or adhere together in storage or shipment;
5 wrapping sheets must be easily removable and not present the consumer with any problems of opening or disposal;
6 bales must permit ready sampling of the contents;
7 destination, grade, origin, technical classification, shipping and other official marks on the bale must be permanent;
8 bale coatings and marking compounds must not cause any deterioration of the rubber or present manufacturers with any technical problems in processing.

It is true that bare back bales do not fulfil all these conditions completely but they do so with considerable advantage over hessian and wooden case packings. The method is satisfactory if the packing is carried out carefully.

The main defects in bare back bales arise from:

1 insufficient compression of the bale and insufficient time of compression, or a combination of both during the final packing;
2 uneven stacking of the sheets before pressing;
3 the use of poor talc and bale coating solutions.

At one time numerous complaints arose of massing and distortion during storage and in transit. Lack of suitable presses was originally responsible for most of the deformation but now the situation is much improved. Nevertheless, badly packed consignments are still sent for shipment, these are mainly due to inadequate compression of the bales in packing. When loosely packed bales are subjected to heavy pressure, as occurs in the hold of a ship, considerable flow results and massing inevitably occurs even if a good bale coating is employed. This massing and deformation is of great importance, since badly packed bales result in increased costs in handling, loss of bales by obliteration of marking, downgrading of others for similar reasons, increased inspection and insurance costs, the inconvenience of arbitration and claims, coupled with a general confusion which in the long run does the reputation of natural rubber much harm, and more immediately causes losses all round.

Massing can be largely prevented by treatment of the bale wrapper sheets with a good talcum power. This gives a surface which allows slip, prevents dirt being picked up and avoids adhesion between stored bales though it cannot be expected to be completely effective for distorted bales. Some manufacturers remove the wrapping sheets before mastication for processing, others prefer to masticate the complete bale, wrapper sheets included. To satisfy the former the bale is dusted with talc before the wrapped sheets are placed in position and this facilitates their removal in the factory. The second group accept the inclusion of a little talcum powder, provided that it and the coating disperses completely in processing. There are two readily available materials which can give this necessary dispersion in processing, provided they are ground to a fine powder, and also give suitable protection to the rubber bale. These are hydrated magnesium silicate (also called talc, magnesium silicate, soapstone, French chalk, *etc*) and calcium carbonate (also called calcite, limestone, whiting, *etc*). It may be mentioned here that hydrated aluminium silicate (China clay, white bole, kaolin, *etc*), calcium sulphate (gypsum), mixed carbonates and other materials are not at present allowable.

To provide a smooth, firm, adhesive, continuous coating to the surface of a bale, the talcum powder was originally dispersed in petrol or kerosene thickened with clean scrap rubber to form a paint. This coating was satisfactory but as a result of fires in godowns attributed to the use of petrol, insurance companies imposed a high premium to cover any packer using petrol. Packers then turned to a non-inflammable coating which contained talc dispersed in animal glue and water, or in starch pastes and water. These coatings have several disadvantages in application, but the main objections to them are that:

1 they do not remain intact during shipment causing obliteration of identification marks;

2 they become very hard and brittle and some flakes remain attached to the bale while others splinter off and become embedded in the rubber. These hard splinters and flakes cannot always be removed and they do not disperse on mastication of the rubber. Frequent spoilage of manufactured articles results;

3 they take several hours to dry to a firm base for identification marks.

The use of these coatings has cost the natural rubber industry considerable sums of money in claims and has given natural rubber a bad name for packing and handling.

These glue based coatings have now been replaced by talc dispersed in a rubber petroleum solution similar to the talc petrol-rubber gum dispersion used originally. The petrol has been replaced with mineral turpentine, a petroleum fraction between petrol and kerosene, and this material being less inflammable is exempt from the high premiums charged on insurance coverage for petrol gum solutions.

The most stringent packing specifications at present in operation, and those which would preserve the rubber in best condition for the consumer, are those of the Rubber Manufacturers Association Inc of the U.S.A. and the Rubber Trade Association of New York, Inc.

We have examined the RMA and RTA of New York specifications for packing ribbed smoked sheets and for the talcum powder and coating solution to be used in packing. Below are extracts quoted from these specifications which embody the most desirable procedure and requirements available at the present time, and we recommend that bales be packed in accordance with them, irrespective of their destination, provided of course no special or particular manufacturers' requirements are to be met.

EXTRACTS FROM RMA AND RTA OF NEW YORK NATURAL RUBBER PACKING SPECIFICATIONS

Section 1. Ribbed Smoked Sheets

(*a*) All Ribbed Smoked Sheets shall be packed in rubber covered bales.

(*b*) The maximum weight of each bale should be 250 lbs. net per five cu. ft. outside measurements. The minimum weight of each bale shall be 224 lbs. net, except where lower weights are specified in the buyer's contract. Each bale within a given shipment covered by a single bill of lading shall be of uniform weight.

(*c*) Each bale must be wrapped on all sides and corners with equal or higher quality rubber of the same type. Double wrapper sheets must be used if wrapper sheets contain holes. No metal bands or wire or non-metallic binders shall be placed under wrapper sheets.

(*d*) For No. 1X, No. 1, and No. 2 Ribbed Smoked Sheets the outside of the bales shall be lightly dusted with talc before applying the wrapper sheets to prevent sticking. Talc must not appear in any other part of the bale. For Nos. 3, 4, and 5 Ribbed Smoked Sheets, no talc shall be used on the inside of the wrapper sheet, nor in any other part of the bale.

(*e*) To overcome adhesion in transit and also to provide proper background for stenciling of colored shipping marks, the outside of the wrapper sheet must be completely and entirely painted on all six sides with one coat of the RMA bale coating solution. No other bale coating solution may be used, except where such use has been specifically accepted by the buyer. (The formula for this solution is shown in Section 7. .....)

(*f*) Bale markings, as required in Section 8, ..., shall appear on two adjoining sides of the bale.

Note (*d*): Only light dusting with talc for No. 1X, No. 1 and No. 2 R.S.S. before applying the wrapping sheet, is allowable. This supercedes previous specifications where a total of $\frac{3}{4}$ lb per bale was allowed for dusting. Also dusting between sheets in a bale is not permissable as previously, although few producers ever packed bales in this manner.

Section 6. Talc Specifications

Talc is basically a hydrous magnesium silicate mineral with the presence or absence of other chemical components creating differences in the physical characteristics of the ore itself. The terms soapstone, magnesium silicate, steatite, fibrous talc, are frequently used interchangeably with talc. However, in general the term talc is more widely used than the other names.

In addition to the above materials, whiting or calcium carbonate may be used in coating and packing natural rubber.

The powders used must meet the following minimum specifications when washed through the following sieves:

100% penetration through standard U.S. Sieve No. 100
93% penetration through standard U.S. Sieve No. 325

The screens used for testing should conform to the U.S. Standard Sieve Series Equivalents, as specified by the American Society for Testing Materials, A.S.T.M. designation E 11-39.

The specific gravity of the powders used may range from 2.60 to 2.90 and the slip characteristics must range from Good to Excellent.

Note: This indicates that any good grade of true talc or calcium carbonate may be used. It is important that the sieve analysis be met, since a coarse coating gives rise to poor dispersability on manufacture besides giving a rougher, less smooth base for marking.

Section 7. Bale Coating Solution

The solvent that must be used in the RMA bale coating solution, previously specified in RMA packing specifications as mineral

turpentine, is an aliphatic hydrocarbon of petroleum distillate with a distillation range of 290° F. to 410° F. The specific gravity at 60° F. ranges from 0.766 to 0.830. The flash point in a closed cup ranges from 90° F. to 105° F.

Known trade names of this material as distributed in Southeast Asia are as follows: Shell Oil—"Mineral Turpentine"; Standard Vacuum Oil—"Varnolene".

Following herewith is the formula for the RMA bale coating solution:

Coating Mixture

4 U.S. gal. Solvent (above)
16 lbs Gum Solution (see below)
Up to 48 lbs. fine Talcum (or reduced amount depending on presence of calcium carbonate). (Enough for coating approximately 75 bales.)

Gum Solution

½ lb. Pale Crepe cuttings (or clean RSS)
1 U.S. gal. Solvent (above)
(Leave for 24 hours, then add ½ gal. Solvent [above])

Experience has shown that talcums available for sale in the rubber producing areas vary as to their weight per unit volume. If lighter weight varieties of talcum are used, strict adherence to the above formula may result in a solution too heavy to be practicable. In these cases, instead of using the specific amount of talcum by weight shown in the above formula, it may be necessary to reduce the quantity of talc with the objective of producing a bale coating solution which will flow on readily and remain bonded to the rubber after drying.

The Indonesian Rubber Research Institute has reported satisfactory results by increasing the proportion of rubber to solvent in the *gum solution* from the specified ratio of ½ lb. rubber to 1½ U.S. gal. total solvent to ½ lb. rubber to 1 U.S. gal. total solvent and reducing the amount of talc in the coating mixture to approximately 27 lbs.

Note: As a result of independent laboratory tests we are also of the opinion that a reduction in the amount of talc and corresponding reduction in the amount of solvent in the coating mixture is satisfactory, but a final recommendation awaits the outcome of proposed trials on shipments of rubber. The quantities above have been translated below to imperial gallons and the quantities of gum solution adjusted to correspond with the amount of additional materials to make the bale coating solution. Mineral Turpentine is sold in Malaya to a specification specific gravity of 0.81 at 60°F and variations in this property are not significant. The following procedure is recommended:

1 Cut ¾ lb pale crepe or clean RSS into small lumps;
2 leave rubber to stand in 10 imperial pints of Mineral Turpentine for 24 hours (or longer if time is available);
3 Add 5 imperial pints of Mineral Turpentine, stir vigorously or shake until all the rubber is evenly dispersed in solution;
4 Add 3¼ imperial gallons (26 pints) of Mineral Turpentine, stir well until the solution is again homogeneous;
5 Add up to 48 lb fine talcum (or reduced amount depending on presence of calcium carbonate) stirring continuously.

The resulting solution is a paste which should be applied vigorously with a stiffish brush. The quantity is about enough for 75 bales. It has been found that generally the finer the powder the less is required to make a coating of given thickness. Thus there may be economy in using powder much finer than required and the resulting coat will be much better.

Section 8. Bale Marking Requirements

At least the following marks, in addition to those required by law must appear on each bale:

(a) *Grade Marks* — Eight-inch characters on two sides of the bale.

(b) *Firm Marks* — Five-inch letters identifying the shipper's firm on two sides of the bale.

(c) *Lot Identification Marks* — Five-inch numbers appearing immediately below the firm marks on two sides of the bale. These numbers must be the same on all bales covered by the same bill of lading. Different numbers must be used for each separate bill of lading covering lots shipped by a single firm and loaded on the same vessel.

These marks must be stenciled on rubber covered bales or on the burlap or rubber patches.

The following marking solution is required: Dissolve 2 lbs. rubber in 7 gallons of kerosene or mineral turpentine. By cutting the rubber into half-inch squares, it will dissolve more quickly. This forms a basic solution into which dyes or pigments are introduced at time of stenciling.

Certain satisfactory results have been reported in producing a marking paint which penetrates through the coating into the wrapper sheets by addition of resins and low viscosity petroleum oils to the marking mixture of rubber and mineral turpentine. Provided further investigation demonstrates the acceptability of these newer marking mixtures a standard RMA mixture will be subsequently specified.

Note: This specification as far as the marking solution is concerned is more tentative than the others. Many pigments have been tested at the R.R.I. and many are not suitable because of fading, of injurious metal contents *etc* but the usual black and red paints (and red, yellow and blue paints for technical classification symbols) used for marking seem satisfactory, as complaints of obliteration are usually ascribed to the poor bale coating base. Research is continuing to develop better bale marking paint mixes.

CONCLUSION

Once the bales are pressed, coated and marked they should be carefully stacked, otherwise even well packed bales may lose their shape. The initial stacking if done well serves as an extension of the pressing period enabling good uniform well compacted bales to be despatched. This in turn facilitates stowage, and minimises distortion in transit.

Synthetic rubber is packed in small brick shaped bales of 75 lb each. These have been found easy to handle and stack and the suggestion has been made that bales of this kind made of smoked sheet would

be less liable to distortion. An experimental consignment of 20 tons was prepared and shipped by us. Reports on this consignment were favourable with respect to deformation, massing and ease of handling, but unfavourable as far as cost in packing and handling were concerned. Manufacturers geared to the use of the customary large bales were noncommittal regarding the smaller bales. The general opinion appears to be that the present 224-250 lb bale will remain and that any effort to improve this packing will be well received. We have experimented with alkathene sheets between the wrapping sheets and the bale, and using chlorinated rubber for bale wrappings. These are rejected on considerations of cost.

Planting Manual No. 10, *Socfin Method for 'Naked' Baling of Rubber* (Sections A to D) details press boxes and baling procedures which are known to give satisfactory bales.

Advice or analysis of bale coating powders may be obtained from us. A short note on identification of bale coating powders appeared in *Planters' Bulletin,* New Series No. 2, reprints of which may be obtained on request. Another note identifying bale coatings follows this article.

Reprints of this article, which replaces Circular No. 24, are available on request. Copies of 'Type Descriptions and Packing Specifications for Natural Rubber' adopted by the R M A and endorsed by the R T A of New York, effective from 1 July 1952, may also be obtained from us.—Editor.

CHEMICAL DIVISION

Identification of Water Based Bale Coatings

AFTER THE JAPANESE OCCUPATION in Malaya, a talc suspension in a petrol rubber solution was used for coating bare back bales. Fires in godowns where this mixture was used led to prohibitive insurance premiums on such buildings. Packers therefore turned to the best non-inflammable coating mixture available at the time. This was a talc dispersion in a suitable vegetable glue such as water and sago, rice or tapioca flour. Occasionally a bone glue was used. It was found that these coatings became very hard; in transit flakes were dislodged, bale markings became obliterated and hard particles entered the bales. These hard particles caused manufacturing difficulties due to lack of dispersion in processing. A return to the original type of coating was then suggested, using mineral turpentine instead of petrol. The former is deemed non-inflammable by the insurance companies and does not give rise to high premiums as does petrol. Until recently there has been marked reluctance on the part of some rubber producers and packers to use the better coating of talc in mineral turpentine rubber solution despite specifications demanding them (the specification of the Rubber Trades Association of New York is given on page 81).

Clone	Parentage of mother tree	No. of trees 1952	Yield in lb per tree per annum in year of tapping					
			1st	2nd	3rd	4th	5th	6th
RRI 617†	*BR 2 × RRI 500*	6	13.8	14.1	13.7	17.9	21.5	–
Control			4.8	5.4	7.6	10.8	12.1	–
RRI 618†	*Lun N × RRI 501*	6	15.2	21.3	21.6	20.8	27.6	–
Control			6.7	8.6	10.7	12.2	14.6	–
*RRI 619**	*RRI 501 × Tj 1*	5	11.1	15.4	21.5	14.7	16.3	13.2
Control			4.7	7.1	8.5	8.5	7.7	10.7
RRI 620	*RRI 501 × RRI 511*	6	7.1	16.2	21.5	16.9	23.2	22.4
Control			6.3	9.8	10.8	9.3	9.5	9.7
*RRI 621**	*RRI 504 × Tj 1*	7	7.6	11.2	20.7	17.2	21.2	24.4
Control			3.0	3.6	3.6	3.7	4.5	3.6
RRI 622†	*Tj 1 × Pil B84*	5	14.9	22.6	20.5	21.6	31.0	–
Control			7.4	9.5	8.9	12.6	21.6	–
RRI 623	*PB 49 × Pil B84*	5	23.0	20.5	22.3	19.4	25.5	27.7
Control			7.3	7.3	8.7	10.3	9.7	11.8

Notes: (i) Tapped S/2.d/2.100% at 160 tappings per year.
(ii) The control clone is Pil B84.
(iii) All clones were budded in 1939 except those marked* which were budded in 1940, and those marked† which were budded in 1941.

TABLE II: GIRTH AND BARK MEASUREMENTS OF CLONES RRI 600 – RRI 623

Clone	Average girth in inches March '53	Virgin bark in mm	Renewed bark in millimetres				Brown bast cases 1947-52
			Year 1	Year 2	Year 3	Year 4	
RRI 600	35.2	9.4	6.8	7.6	8.3	8.4	3
601	35.9	10.2	6.8	7.5	7.6	7.9	1
602	34.5	10.7	7.3	7.6	8.7	9.4	–
603	36.8	10.2	7.9	8.7	9.7	9.4	1
604	38.4	9.3	5.6	6.4	7.0	7.1	2
605	31.5	8.9	5.9	6.5	6.8	7.1	1
606	34.7	8.4	5.5	6.2	6.7	6.6	1
607	39.2	8.8	6.0	6.4	7.1	7.6	1
608	32.3	9.8	6.2	7.0	7.2	7.6	1
609	32.8	9.8	5.1	6.9	7.8	7.8	1
*610**	33.4	9.1	6.6	6.7	7.2	7.3	1
*611**	31.9	9.2	6.1	6.8	7.0	7.4	1
612	41.4	11.2	6.7	8.0	8.9	9.0	–
613	28.7	8.5	5.6	5.3	6.2	6.6	1
614	29.2	8.9	6.8	6.4	6.5	7.3	1
615	32.6	9.1	6.4	6.6	6.5	6.9	1
616	30.1	8.8	6.0	6.5	6.6	6.7	1
617†	30.5	9.2	4.9	5.4	6.7	6.8	–
618†	31.8	9.0	4.7	5.2	6.3	6.6	–
*619**	26.3	7.6	5.4	5.0	5.4	5.4	1
620	34.4	9.7	7.1	7.4	7.6	7.3	–
*621**	29.4	8.8	6.1	6.7	6.8	7.3	–
622†	32.8	9.0	5.6	6.4	7.3	7.3	2
623	38.2	8.9	6.0	6.2	6.6	6.7	1

* † See *note* (iii) at foot of TABLE I above.

TABLE IIIA: SECONDARY CHARACTERS OF CLONES RRI 600 – RRI 623 AT THE R.R.I. EXPERIMENT STATION

Clone	Growth	Branching habit	Foliage	Crown
RRI 600	Average	Semi-erect, average	Average	Rather narrow
601	Vigorous	Erect, dense	Very dense	Rather narrow, fanshaped
602	Vigorous	Semi-erect, vigorous	Average	Narrow, irregular
603	Very vigorous	Semi-erect, rather sparse	Average	Rather narrow
604*	Very vigorous	Erect, average	Dense	Narrow, nondescript
605*	Average	Semi-erect, average	Average	Rather narrow
606	Vigorous	Semi-erect, rather dense	Dense	Rather narrow
607	Very vigorous	Semi-erect, average	Dense	Rather wide
608	Average	Semi-erect, fairly dense	Average	Fanshaped
609	Average	Erect, rather dense	Average	Rather narrow
610	Vigorous	Erect, dense	Dense	Rather narrow
611	Average	Spreading, dense to average	Dense, average	Rather wide
612	Outstandingly vigorous	Semi-erect, sparse	Dense	Narrow, fanshaped
613	Average	Semi-erect, average	Average	Rather wide
614	Average	Erect, average	Average	Rather wide and fanshaped
615*	Average	Spreading, dense	Average	Rather wide and fanshaped
616	Average	Spreading, dense	Average	Rather wide and globular
617	Average	Spreading, dense	Dense	Rather irregular
618	Average	Semi-erect, dense and spreading	Dense	Fanshaped
619	Average	Erect, average	Dense	Globular
620	Vigorous	Semi-erect, spreading	Average	Narrow, fanshaped
621	Average	Semi-erect, average	Average	Narrow, fanshaped
622	Vigorous	Semi-erect, average	Dense	Narrow, globular
623	Very vigorous	Erect, dense	Average	Wide, nondescript

* latex may be slightly yellow

TABLE IIIB: SECONDARY CHARACTERS OF CLONES RRI 600 – RRI 623 AT THE R.R.I. EXPERIMENT STATION

Clone	Trunk	Virgin bark	Renewed bark	Suitability for centrifuging
RRI 600	Straight, erect	Smooth, buds not prominent	Slightly rough	Probably not suitable
601	Straight, erect, slightly fluted	Smooth, buds slightly prominent	Slightly rough	Suitable
602	Straight, erect, very slightly fluted	Smooth, buds prominent	Smooth or slightly rough	Possibly suitable
603†	Straight, erect, slightly fluted	Smooth	Smooth	Possibly suitable
604	Slightly curved, leaning	Smooth	Smooth	Possibly suitable
605	Straight, erect	Smooth	Smooth	Probably not suitable
606	Straight, erect, slightly fluted	Smooth	Slightly rough	Suitable
607	Straight, erect	Smooth	Smooth	Suitable
608‡	Very slightly curved and fluted	Smooth	Slightly rough	Probably not suitable
609	Straight, erect	Smooth	Smooth	Suitable
610	Straight, erect	Smooth	Very smooth	Probably not suitable
611	Slightly curved, leaning, fluted	Smooth	Slightly rough	Possibly suitable
612	Straight, erect	Smooth	Slightly rough	Suitable
613†	Slightly curved, erect	Smooth	Smooth	Probably not suitable
614	Slightly curved, erect	Smooth	Slightly rough	Suitable
615‡	Very slightly curved and leaning	Smooth, buds slightly prominent	Smooth	Suitable
616‡	Slightly curved and leaning	Smooth	Smooth	Probably not suitable
617	Straight, erect	Smooth, buds slightly prominent	Smooth	Suitable
618	Straight, erect	Buds slightly prominent smooth	Smooth and slightly bumpy	Probably not suitable
619	Slightly curved	Buds slightly prominent smooth	Slightly bumpy and rough	Probably not suitable
620	Slightly curved and leaning	Slightly bumpy	Slightly bumpy and rough	Suitable
621	Slightly curved and leaning	Smooth, slightly fluted	Very slightly rough	Probably not suitable
622	Straight, erect, smooth	Smooth, slightly fluted	Smooth and slightly rough	Suitable
623	Slightly curved erect, smooth	Smooth	Slightly rough	Suitable

† *may require pruning when young*

‡ *may be difficult to bud*

Distribution of budwood — Pending the results of the large scale trials it is felt that small supplies of budwood should be released for estates to make their own trials. The procedure we ask estates to adopt is to multiply the budwood purchased, which will be five yards of some or all of the clones applied for. With the products of the budwood multiplication it should be possible to bud one task in a new clearing, or a replanting, which is due for budding in 1954.

With this object in view we attach an order sheet which should be completed and returned to us as soon as possible. We will endeavour to supply budwood of the clones asked for, but a second choice should be made, as the demand for some of the clones may exceed the supply. Orders will be dealt with in strict rotation until supplies give out. When the buddings come into tapping we may ask estates to supply yield data and to allow us to inspect and make notes of the secondary characters of the clones.

Reprints of this article may be obtained on request.

BOTANICAL DIVISION

Bare Back Baling of Sheet Rubber

THE HISTORY OF PACKING RUBBER is one of endeavour to obtain a cheap protective covering for pressed bales which makes for ease in handling, in transit and in the buyer's factory. In the early years of the century rubber was shipped almost entirely in packing cases. These gave way in the 1920's to cheaper and less satisfactory plywood chests which often broke under pressure in ships' holds frequently producing splinters deeply embedded in the rubber. These cases were replaced gradually by burlap or matting. The depression in the 1930's encouraged this change since burlap was cheaper and allowed more rubber to be shipped in a given cargo space. As a logical conclusion to the paring away of wrapping materials on rubber bales, in the years immediately preceding the Japanese occupation of Malaya increasing quantities of rubber were exported in 'bare back bales'. These are standard bales of 5 cubic feet (nominal volume) containing 224-250 lb rubber wrapped in rubber sheets and coated on the outside with a talc paint. No hessian or metal straps were used. This packing when properly done was satisfactory and our sample shipments were well received by users, particularly in America.

After the occupation of Malaya plywood cases were not available and all burlap was allocated to food producers. By universal agreement all ribbed smoked sheet was allowed to be packed in bare back bales for an interim period. This method of packing has now become the accepted practice and is subject to a number of specifications by the Rubber Trade organisations in several countries. Bare back bales must ideally fulfil the following conditions:

1 the method of packing must be cheap;
2 the bale must be rigid, and withstand prolonged stacking in storage and in shipment without deformation;
3 the bale must be protected from contamination;

Stimulation of Yield of Rubber Trees

IT IS NOW AN ESTABLISHED FACT that the yield of rubber trees can be increased either by treatment of the bark below the tapping cut with yield stimulating mixtures containing a hormone or by injection of copper sulphate in holes bored into the trees at the level of the tapping cut. For how long increased yields can be maintained with repeated application of these treatments, without some reaction such as increased brown bast incidence or retardation in growth and bark renewal, cannot be foretold as all experiments are of relatively recent date.

All the experiments but one on the R.R.I. Experiment Station have been carried out on seedling trees and although we have collaborated in estate experiments on budded trees no general information can yet be given on the reactions of different clones to yield stimulants. Work on this subject is in progress. Interaction of tapping systems with application of yield stimulating mixtures has been studied only in relation to slaughter tapping systems. We have no information yet concerning the effect of yield stimulants on trees tapped on full circumference or periodic tapping systems, as in all our experiments from which results are available the trees have been tapped on the standard system of alternate daily tapping on a half circumference cut (S/2.d/2.100%).

STIMULATION BY INJECTING WITH COPPER SULPHATE

Injection of copper sulphate into rubber trees as a means of increasing the yield has certain disadvantages and cannot be recommended for use in general practice although satisfactory yield increases (albeit smaller than those obtained by treating bark below the tapping cut with certain yield stimulating mixtures) have been obtained by this method. The main disadvantages of the copper sulphate injection method are:

a the damage to bark and wood even when the operation of injection is carried out with the greatest possible care. The bark, cambium and wood around and at some distance from the injection hole are killed by the copper sulphate. See *Figures 1* and *2*.

b the laborious and costly procedure of boring holes into trees by hand auger which on a large scale would not be economic unless it is carried out by means of mechanically operated drilling equipment.

c the possible contamination of the latex with copper, the adverse effects of which may have serious and far reaching consequences. Although in a series of carefully controlled experiments carried out at this Institute two injections of 10 grams per tree of copper sulphate made at six months' intervals did not result in an appreciable increase of the copper content of the latex concentrates, which remained well within the limit of 10 parts per million of copper stipulated by the American Society for Testing Materials. Adherence to this specification is a normal condition of a contract to supply latex concentrates to the United States of America.

Danger lies in accidental contamination of the latex by spilling of copper sulphate on to the tapping cut, spout or into the cup in the course of applying the injection treatment on a commercial scale. The

Figure 1. Bark damage as a result of careless injection of copper sulphate. The copper sulphate came into direct contact with the bark. The bark, cambium and wood round and at some distance from the injection hole were killed by the copper sulphate.

Figure 2. Damage as a result of careful injection of copper sulphate. No copper sulphate came into contact with the bark and the injection hole was plugged up tightly with a rubber cork. This type of damage was observed for the first time after the tree had been felled and sectioned. Note the dead cambium and discolouration of the wood.

Rubber Manufacturers Association of New York has specified that no RMA grade of rubber may contain more than 8 parts per million of copper because of the catalytic effect that copper has upon the rate of oxidation of the rubber, as rubbers which contain amounts of copper appreciably in excess of the specified limits rapidly soften and become sticky and this effect may persist after the raw rubber has been converted into manufactured articles. Eight parts per million of copper in the finished rubber is equivalent to an addition of only two ounces of copper sulphate to 1,000 gallons of field latex.

It is clear therefore that copper treatment of the trees must not result in an increased copper content of the latex beyond the specified limits no matter what its beneficial effect may be.

STIMULATION BY TREATMENT OF THE BARK WITH MIXTURES CONTAINING HORMONES

In this brief account only those mixtures which are either readily obtainable or easily prepared are mentioned. A full account of our work on yield stimulation from 1940 onwards will be given in a forthcoming issue of the Journal of the Rubber Research Institute of Malaya but in this note only the main results of our post-war experiments are considered. In addition to the two proprietary mixtures available in Malaya, namely Stimulex and Eureka, we have used in our experiments different concentrations of the sodium salt of 2,4-dichlorophenoxy acetic acid as water in palm oil emulsions. In more recent experiments we have used the n-butyl ester of 2,4-dichlorophenoxy acetic acid which, unlike the sodium salt, is readily soluble in palm oil and consequently does not require the rather tedious emulsification procedure. Both the sodium salt and the n-butyl ester of 2,4-dichlorophenoxy acetic acid in concentrations of 1 to 2 per cent in palm oil have been shown to be effective yield stimulating mixtures.

Method of application – The mixture is normally applied to a three inch wide strip of lightly scraped bark immediately below the tapping cut. Buddings must be scraped very carefully and only the dead outer bark tissues may be removed. Seedlings may be scraped deeper than budded trees but no more than a few pin points of latex should exude as a result of scraping for our pre-war experiments have shown that too deep scraping may lead to a marked decrease in yield. The beads of latex exuding from the lightly scraped bark are allowed to coagulate (10 to 15 minutes) and the scraped surface is wiped clean before the mixture is applied to it. A flat paint brush of about two inches in width has proved convenient in our experiments, and great care should be taken to apply the mixture thinly and evenly. A thick coating not only fails to raise the yield increase but may damage the scraped bark seriously or even kill it.

We have found it satisfactory in practice to use a gang of five labourers with four men to do the scraping and one man to apply the yield stimulant to the scraped bark; the former working along a row of trees, one row to each man, and the latter working across the rows. Depending on the size of the trees such a gang can cope with 400 to 600 trees per day and about one gallon of the yield stimulating mixture is sufficient to treat 800 to 1000 trees.

From these figures the cost of application per tree can be easily calculated if the price of the mixture is known. With half circumference tapping and using a proprietary mixture this works out at 5 to 7 cents per tree depending on the girth of the trees and the cost of labour.

Frequency of application — Trees in normal commercial tapping should not be treated more often than once in six months as more frequent application may result in a decrease in yield after some time.

Yield increase — The increase of yield as a result of application of a yield stimulant would depend on the clone or seedling family and on the growing conditions. Our experiments have been carried out on the R.R.I. Experiment Station on planting material which yields about 1000 lb/acre/year. Even on this high yielding material good yield increases have been obtained, which in our oldest post-war experiment were, over

a period of 1½ years, on the average between 20 to 30% above the normal yield level. No increase of brown bast incidence or other detrimental symptoms have been observed so far in any of our experiments. In one experiment carried out on an estate on old seedling material yielding less than 500 lb/acre/year a mean yield increase of approximately 75% has been obtained over a period of 14 months, by application of a yield stimulant once in seven months.

The effect of an application of yield stimulating mixture does not usually last longer than 3 months after which the yield is back to normal as, indeed, was shown in our pre-war experiments. In none of our experiments on seedling trees has the yield dropped below the normal level.

Late Dripping — The increase in yield is largely due to a longer period of latex flow and conseqently it is recommended that the latex be collected at least one hour after normal time of collection, when there may be many trees in which dripping continues at a very slow rate which would not justify a longer postponement of collection.

Effect on Bark — Application of all the abovementioned yield stimulating mixtures causes an increase in bark thickness on the lower part of treated strip of bark below the cut. The increased thickness, due to highly active cell division in the bark, shows up clearly two months after treatment in the outer cortical region of the bark which is not latex bearing. This may even result in a loss of crop if the tapper maintains the same depth of tapping so that a larger number of the most productive inner rows of latex vessels are not opened.

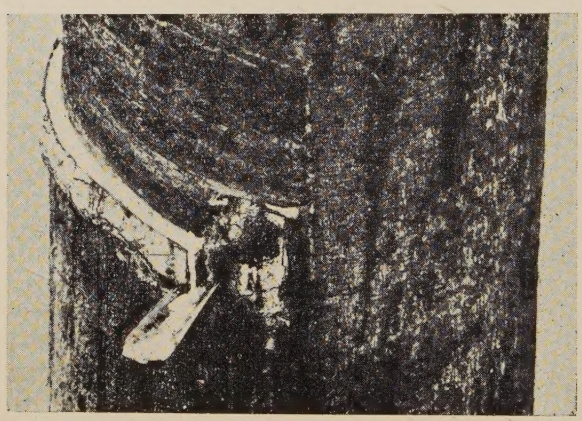


Figure 3. Effect on bark of application of a hormone containing yield stimulant. Note locally increased bark thickness and tendency to shallow tapping (4 to 5 mm of bark were left untapped). The burr at the lower end of the tapping cut is not associated with the bark treatment.

CONCLUSIONS

1 Copper sulphate should not be used for stimulating the yield of rubber trees.

2 Both proprietary mixtures and the sodium salt or n-butyl ester of 2,4-dichlorophenoxy acetic acid (2,4-D), at concentrations of 1 to 2 per cent in palm oil, have given large increases in yield.

3 As long term results are not yet available we advise caution in the use of yield stimulants on high yielding clones or seedling families.

BOTANICAL DIVISION

Some Planting Manuals

LATEX PRESERVATION, CONCENTRATION AND SHIPMENT

A practical review of latex preservation and shipment as a commercial process, to assist producers contemplating entering the field. A survey of patents on latex preservation and concentration is included. Planting Manual No. 4. *By J.H. Pidford. second edition, 1947, $2.*

THE USES AND CONTROL OF NATURAL UNDERGROWTH ON RUBBER ESTATES

A consideration of the best methods for the establishment, maintenance and control of indigenous cover plants, copiously illustrated. An appendix classifies cover plants practically and contains about 80 full page drawings. Planting Manual No. 6. *Second edition being a revision of the original by W.B. Haines, 1940, $2.*

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The R.R.I's recommendations on the construction and operation of tunnel type smoke houses, based on a long series of experiments. With plans and bills of quantities. Planting Manual No. 9. *1949, $2.*

SOCFIN METHOD FOR "NAKED" BALING OF RUBBER

Full information, with illustrations and working drawings, of a method of baling sheet rubber which has been very well received by consumers overseas. Planting Manual No. 10 *By Socfin Company, 1951, $2 (only available in Malaya).*

These books are available from the R.R.I., P.O. Box 150, Kuala Lumpur. Planting Manuals Nos. 1, 2, and 7 are obsolete and out of stock, but we shall be pleased to pay $2 each on receipt of any unwanted copies of these publications in good condition.

THE PHOTOGRAPH ON THE FRONT COVER SHOWS THE EFFECT ON BARK OF THE APPLICATION OF A YIELD STIMULANT.

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